LETTERS TO THE EDITOR.

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The Place of Science in Education.

THE memorandum regarding the neglect of science to which you refer in your leading article last week fails in my judgment by its moderation. The proposal that at least as many marks in the Civil Service examinations shall be allotted to science as to classics, may be a step in the right direction, but it is a halting one, for it affects only a limited class of the community and does not insist on the *paramount importance* of science in general education. What should be stated is not the least, but the whole of what is necessary. What ought to be made clear is that science must form not a mere adjunct but the actual foundation of the education given in secondary schools. In a word, what is wanted is a *revolution* in our educational system.

Unless the public appreciates the necessity for the change no such revolution is possible; when it does, the mechanism of converting the proposition into action will be simple. If the democracy once understands that we have no chance of keeping our place in the sun unless we are prepared to recognise that whether in peace or war science must be the dominant factor in education all difficulties will disappear. But if this idea fails to take root our place will be lost; and such a place once lost can never be regained. The revelations which have come to light in the course of this bloody war will, we hope, do at least this good, that the people may be induced to appreciate the necessity of basing education upon natural science instead of upon the classics.

The appointment of a Minister of Science which is advocated in the memorandum would under existing conditions be of little use. Whatever qualifications he might be selected for, we may safely prophesy that entire ignorance of the subject he is to administer would be one. It might, however, be argued that this would be a useful asset, for he would at least be gloriously impartial in the various branches of science which would come under his administration.

E. A. SCHÄFER.

University of Edinburgh, February 14.

Relations between the K and L Series of the High-Frequency Spectra.

KOSSEL has shown that for the K and L lines in the high-frequency spectra the following relation holds good:—

$\nu_{L\alpha} = \nu_{K\beta} - \nu_{K\alpha}$ where ν is the frequency.

This relation is deduced on the assumption of the Bohr-Rutherford's atomic model. As the result of new measurements, J. Malmer in his inaugural dissertation, Lund, 1915, states that the K series consists of four lines, called α_1, α_2, β_1, β_2, and that Kossel's relation must take the form—

$$\nu_{L\alpha} = \nu_{K\beta_1} - \nu_{K\alpha_2}.$$

An investigation of the spectra of the L series, which has been carried out by E. Friman and the writer, has shown that there is in reality an additional line near the $L\alpha$, with a slightly greater wave-length. Further, the L series contains two lines, called by Moseley the β and γ lines, which I will denote by β_1 and β_2, as they seem to be a doublet. The ϕ lines observed by Moseley are probably due to some impurities, as they fit fairly well in a series if they are ascribed to other elements. For antimony, we have, according to Malmer, the following relative results:—

	λ	ν
$K\alpha_2$	0·472	2·119
$K\alpha_1$	0·468	2·137
$K\beta_1$	0·416	2·407
$K\beta_2$	0·408	2·451

From this we get:—

	ν	λ calculated	λ for L series measured
$K\beta_1 - K\alpha_2$	0·285	3·51	3·46 = α_1
$K\beta_1 - K\alpha_1$	0·267	3·74	[3·7] · · α_2
$K\beta_2 - K\alpha_2$	0·332	3·01	[3·06] · β_2
$K\beta_2 - K\alpha_1$	0·314	3·18	3·25 β_1

The values in the last column are those given by Moseley for $L\alpha_1$ and $L\beta_1$, and the values for $L\alpha_2$ and $L\beta_2$ are extrapolated.

MANNE SIEGBAHN.

Physical Laboratories, Lund, Sweden,
January 1.

Educational Work in Museums.

IN view of the decision of the Government to close the national museums and art galleries and its probable influence on those responsible for provincial institutions of the same kind, it would perhaps be useful to direct attention to its effect on a branch of museum work which has been started in Manchester as a direct result of the effects of the war.

Owing to the taking over of their buildings for military hospitals, several schools in the Manchester district found themselves temporarily without homes. In order to meet this emergency, the education authorities have instituted what might be termed a half-time system in certain of the remaining schools in order that the scholars from the dispossessed schools should have at least some instruction. The problem then arose of what to do with the scholars for the other half of their time. The Museum Committee was consulted, and asked what help it could render in the emergency, and the keeper of the museum, in consultation with the education authorities, drew up a scheme under which the scholars are now receiving instruction in natural history and Egyptology in the museum buildings.

The education authorities appointed two teachers, already on their staff, to take charge of the work at the museum, one to teach biology and the other geology. The committee placed two rooms at the disposal of the teachers and provided them with duplicate specimens from the reserve collections which could be used and handled freely by both teachers and scholars.

Courses of lessons in geology and natural history were drawn up by the teachers in consultation with the staff of the museum, framed according to the time available and the number of scholars to be dealt with.

Eight classes—of one hour's duration—are held daily, four by each teacher: two in the morning and two in the afternoon. Each lesson consists of from thirty to forty minutes' instruction in the classroom, followed by a tour of the cases in the museum dealing with the particular subject taught, and each course consists of about nine lessons.

In addition to the instruction in natural history the assistant in charge of the Egyptian department gives short courses of lessons in Egyptology to school classes, and four such classes are held weekly.

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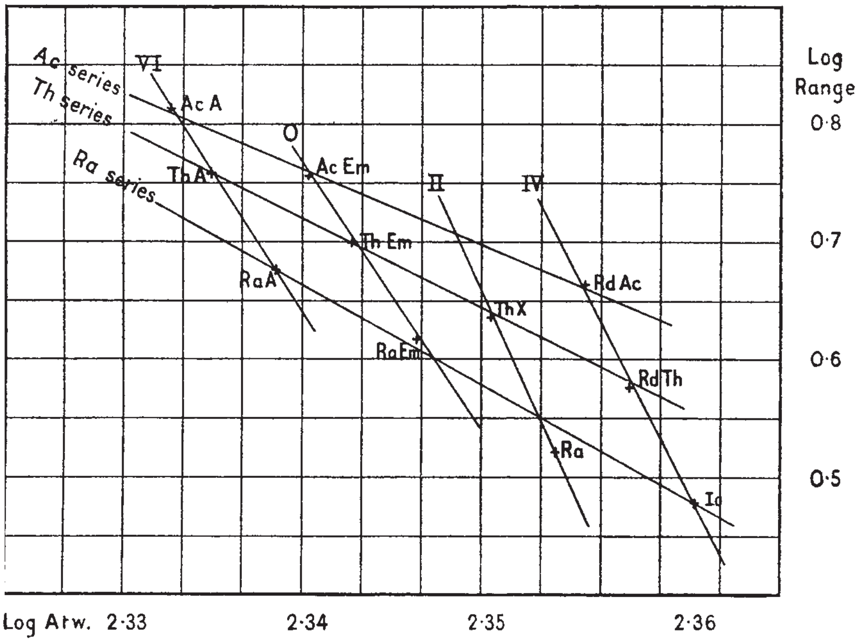
By these arrangements effective instruction in the museum is provided for 900 to 1000 children per week. This work was undertaken in response to the appeal of the Education Committee, and in one sense at least it may be regarded as war emergency work. Its real value and usefulness have already been appreciated by the education authorities and by the teachers. But if the museum should be closed down, how can the work go on? What is to be done with the children? They have already been deprived of their schools by the military authorities. It is very desirable that they should not now be denied the valuable alternative instruction provided for them. The same problem will probably arise in many of the provincial towns in the country where similar work is being done.

W. M. Tattersall.

The Manchester Museum.

A Relation between Atomic Weights and Radio-active Constants.

The interesting relation given by Mr. F. Gilbert Carruthers in Nature of January 20, p. 565, holds, for corresponding isotopes, nearly exactly, if, as suggested by Fajans, the atomic weight of actinium should be 227 instead of 226. From IV. to VI.B the only exception is AcX (and perhaps Ra). But the lines are not parallel, and not equally spaced.



A. van den Broek.

Gorsel, Holland, January 25.

Asteroids Feeding upon Living Sea-Anemones.

As bearing upon the observations recorded by Mr. H. N. Milligan in Nature of February 3, I should like to say that two of ten specimens of *Eupargurus prideauxii,* which have been kept in the aquarium of this institution since last autumn, died on January 23. The molluscan shell occupied by one of these specimens was that of *Trochus magus,* that occupied by the other was of *Scaphander lignarius.* Both shells were, as usual, enveloped by a specimen of the anemone *Adamsia palliata.* When I first noticed the dead hermit-crabs both lay on the gravel at the bottom of the tank with their ventral surfaces uppermost, and in both cases the abdomen was partially withdrawn from the molluscan shell. Both had been attacked and partially enveloped, one by two half-grown specimens of the asteroid *Porania pulvillus,* and the other by one rather larger specimen.

As I have for some time been interested in the feeding habits of Porania and Solaster, I wished to see what would happen and did not disturb the specimens until the following morning. I then found that no appreciable impression had been made by the starfishes upon the soft abdomens of the hermit-crabs; but I was much interested to find that in both cases the enveloping anemone had discharged a considerable number of acontia, with which the actinal surfaces of the starfishes, and probably their partially everted stomachs, had been in contact.

My observations of the feeding habits of Porania have extended over two years, and I have invariably found it an exceedingly slow feeder. As shown by Gemmill (Proc. Zool. Soc., March, 1915, p. 13), this species is capable of subsisting for long periods upon microscopic food particles swept into the digestive tract by ciliary currents. My own observations tend to confirm those of Gemmill; and in view of such a capacity it appears to me to be remarkable that a voluntary attack should have been made upon so large a morsel as the abdomen of a Eupagurus, especially when protected, as is commonly assumed, by an actinian. The anemones did not show any outward sign of injury beyond partial relaxation of their hold upon the molluscan shells.

H. C. Chadwick.

The Biological Station,
Port Erin.

Colourless Crystals of Hæmoglobin.

Crystals of hæmatoidin in old blood extravasations in tissues are not—or at any rate have not been in the cases I have examined—soluble in chloroform or other solvents of bilirubin either with or without acidification. The colour dissolves out readily enough, but a transparent shape remains in the form of the original crystal. I have assumed that this remnant is a proteid basis similar to those which are well known in the crystals of urinary deposits and in calculi, and it is possible that Prof. Fraser Harris's curious experiences with hæmoglobin crystals are explicable along these lines. It is at least likely that hæmoglobin crystals prepared in the ordinary way contain also some serum proteid.

A. E. Boycott.

17 Loom Lane, Radlett, February 4.

Tubular Rock Structures.

The council of the Geophysics Society desires to obtain records of mineral growths taking the form of hollow cylinders—those not due to organisms, and

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